

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
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Office  
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Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year)

04 October 2000 (04.10.00)

International application No.

PCT/FI00/00157

Applicant's or agent's file reference

âp2891

International filing date (day/month/year)

01 March 2000 (01.03.00)

Priority date (day/month/year)

01 March 1999 (01.03.99)

Applicant

NENNO, Vladimir Erosovitch et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

01 September 2000 (01.09.00)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

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Authorized officer

F. Baechler

Telephone No.: (41-22) 338.83.38

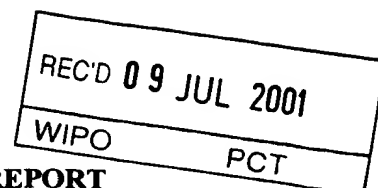
09/9/4/79

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



164

Applicant's or agent's file reference ÅP2891	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00157	International filing date (day/month/year) 01.03.2000	Priority date (day/month/year) 01.03.1999
International Patent Classification (IPC) or national classification and IPC <sub>7</sub> B 03 D 1/24		
Applicant EKO-TEKNIikka-TURKU OY et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 01.09.2000	Date of completion of this report 21.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Ulf Nyström/ELY Telephone No. 08-782 25 00

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00157

## I. Basis of the report

1. With regard to the **elements** of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages 1-14, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages 17, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement) under article 19  
pages \_\_\_\_\_, filed with the demand  
pages 15, 16, filed with the letter of 14.05.2001
- ☒ the drawings:  
pages 1-3, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00157

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-13</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-13</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-13</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

The present invention according to the amended claims 2001-05-14 relates to a froth flotation apparatus of the pneumatic type. The main object of the present invention is to prevent disturbing and destroying of the froth bed, in order to improve the flotation efficiency. This is achieved by moving the froth layer with non-mechanical means and connecting a surface to the feeding means so as to reduce vertical speed component of the material being fed with the feeding means. The material is introduced along that surface from above on and into said froth bed. Vertical plates are installed inside the flotation chamber parallel to the direction of the froth motion in order to prevent transverse froth flow in the apparatus.

Following documents are cited in the international search report:

D1. US 3434596 A  
D2. RU 2067889  
D3. DE 392240 A

Documents D1 and D2 disclose pneumatic froth flotation machines, which comprise aerator means arranged so that the froth layer is moved by directing the flow of bubbles from the aerator means. Said machines comprise feeding means arranged above the froth bed. Said feeding means include an inclined or curved surface so as to reduce the vertical speed component of the material being fed from above on and into said froth bed. In the known arrangement the material being fed is not introduced along the speed reducing surfaces onto the froth bed as defined in the present claims. Furthermore, inside the flotation chamber there are no vertical plates parallel to the direction of the froth motion, as defined in the present claims.

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

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**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V.

Document D3 discloses a flotation vessel divided by vertical parallel plates. The plates do not reach the froth layer and thus the plates do not prevent transverse froth flow in the vessel.

Thus, the apparatus according to the present claims differs from the cited art. Furthermore, in the cited documents there are no suggestions leading a person skilled in the art towards the invention defined by claims 1-13.

Therefore, the invention according to claims 1-13 is novel and is considered to involve an inventive step and to be industrial applicable.

## Claims

1. An apparatus for separation of solids in froth, including
- a housing (1), delimited by two upper side walls (18), two upper end walls (10)  
5 and a mainly funnel shaped bottom (12), the housing (1) establishing a chamber (2) for flows of liquid and solid material and a froth bed (30) on the liquid,
  - feeding means (14) for getting incoming material to be separated in contact with said froth bed (30),
  - 10 – discharging means (6) for solid material near the bottom (12) of said housing (1),
  - aerator means (24, 26) under the liquid surface (78) for creating bubbles and thus forming said froth bed (30) on the liquid in the apparatus, said aerator means (24, 26) being constructed to generate a vertical flux of bubbles substantially nonhomogenous in a horizontal cross-section of the chamber (2), to  
15 generate a moving bed of froth (30) on the liquid,
  - means for discharging froth from the housing (1) including at least a froth outlet (74),
- characterized** by that the apparatus further comprises:
- a surface (32) connected to said feeding means (14) so as to reduce the vertical  
20 speed component of the material being fed with the feeding means (14) along which surface (32) the material being fed is introduced from above said froth bed in and on to said froth bed (30), and
  - one or more vertical plates (40) installed inside the chamber (2) substantially parallel to the direction of the froth motion.

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2. An apparatus as claimed in claim 1, **characterized** by the aerator means including two or more at least partly one above another installed bubble generators (24, 26), each of the bubble generators by itself creating in the horizontal cross-section homogenous flow of bubbles, the main bubble generator (24) covering

substantially the whole length of a horizontal section of the chamber (2) in the direction of the froth motion, and the one or more additional bubble generators (26) covering 2/3 or less of the length of the chamber (2) in the direction of the froth motion starting from the start point of the horizontal froth motion.

5

3. An apparatus as claimed in claim 1, **characterized** by the aerator means (24, 26) including an aerator (24) that is inclined downwards by an angle up to 30 degrees from the horizontal level in the direction of the froth motion.

10 4. An apparatus as claimed in claim 1, **characterized** by a plate (28) being installed above the part of the chamber (2) where the vertical flow of bubbles from the aerator means (24, 26) has its maximum, said plate (28) being inclined upwards in the direction of the froth motion, so that the vertical motion of the rising bubbles is turned into a horizontal motion of the froth bed (30) in a direction towards the froth  
15 outlet.

5. An apparatus as claimed in claim 1, **characterized** by said plates (40) covering substantially the whole length of a horizontal section of the chamber (2).

20 6. An apparatus as claimed in claim 1, **characterized** by the apparatus including two or more chambers (2) for flows of liquid and solid material and a froth bed (30) on the liquid, said two or more chambers (2) being partly separated from each other by at least one partition (8) placed parallel to and between the two upper end walls (10), said two or more chambers (2) being connected with each other in liquid.

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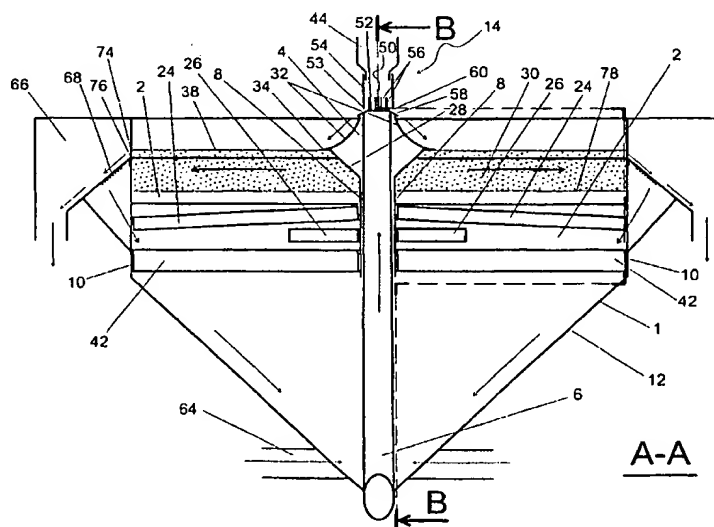
7. An apparatus as claimed in claim 1, **characterized** by, that the feeding means (14) are installed above an end wall (10) or above a partition (8) between the two end walls (10), said feeding means (14) being installed so that the feed material from said feeding means (14) is distributed substantially equally along the whole  
30 length of the said end wall (10) or partition (8).



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : B03D 1/24		A1	(11) International Publication Number: WO 00/51744
			(43) International Publication Date: 8 September 2000 (08.09.00)
(21) International Application Number: PCT/FI00/00157 (22) International Filing Date: 1 March 2000 (01.03.00) (30) Priority Data: 990436 1 March 1999 (01.03.99) FI (71) Applicants (for all designated States except US): EKO-TEKNIKKKA-TURKU OY [FI/FI]; Verkaranta 7 G, FIN-20660 Littoinen (FI). VALTION TEKNIILLI- NEN TUTKIMUSKESKUS [FI/FI]; Vuorimiehentie 5, FIN-02150 Espoo (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): NENNO, Vladimir Erosovitch [MD/MD]; Aleksandresku Street 17 as 13, 2008 Kishinev (MD). LASHKUL, Alexander Vasilievich [UA/FI]; Viskarinpolku 8 F 63, FIN-20210 Turku (FI). LEPPINEN, Jaakko, Olavi [FI/FI]; Poikkikatu 11, FIN-83500 Outokumpu (FI). BJÖRKLÖF, Stig, Viktor [FI/FI]; Hirvenkatu 9 A 2, FIN-20750 Turku (FI). (74) Agent: TURUN PATENTITOIMISTO OY; P.O. Box 99, FIN-20521 Turku (FI).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report.	

(54) Title: APPARATUS FOR SEPARATION OF SOLIDS IN FROTH



## (57) Abstract

An apparatus for separation of solids in froth is presented. The apparatus includes: a housing (1), establishing a chamber (2) for flows of liquid and solid material and a froth bed (30) on the liquid; feeding means (14) for getting incoming material to be separated in contact with said froth bed (30); discharging means (6) for solid material near the bottom (12) of said housing (1); aerator means (24, 26) under the liquid surface (78) for creating bubbles and thus forming said bed of froth (30) and generating movement on the bed of froth (30); means for discharging froth from the housing (1) including at least a froth outlet (74). The apparatus is characterized by a surface (32) connected to said feeding means (14) so as to reduce the vertical speed component of the material being fed with the feeding means (14) from above said froth bed in and on to said froth bed (30).



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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00157

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B03D 1/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3434596 A (O.M.KNAUS), 25 March 1969 (25.03.69), column 3, line 4 - column 5, line 46, figures 1-4  --	1,2,4,6,7,9
X	Derwent's abstract, No 97-270412/24, week 9724, ABSTRACT OF RU, 2067889 (Zlobin M N), 20 October 1996 (20.10.96)  --	1
A	DE 392240 A (GUNNAR SIGGE ADREAS APPELQVIST ET AL), 18 March 1924 (18.03.24), page 2, line 45 - line 48, figures 1,2  -- -----	1-13

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

2 May 2000

Date of mailing of the international search report

24-05-2000

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Ulf Nyström/MP

Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/FI 00/00157

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	3434596	A	25/03/69	NONE	
DE	392240	A	18/03/24	NONE	